Apparatus and Surgical Treatment for Fractures of the Distal End of the Forearm

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Resume*: According to various authors, fractures of the distal metaepiphysis of the forearm bones are among the most common fractures in the structure of upper limb injuries, the share of this pathology is up to 33% of all types of injuries of the musculoskeletal system. There are no generally accepted tactics for the treatment of this pathology yet.*

The purpose of the study. to improve the method of bone distraction osteosynthesis in fractures of the distal end of the forearm bones.

Materials and methods. The analysis was carried out based on the results of treatment of 21 patients aged 45 to 65 years who were hospitalized in the department of emergency traumatology of the Bukhara branch of the Republican Scientific Center for Emergency Medical Care (RNCEMP) in the period from 2019 to 2021.

Results. A study in the long term from 6 months to 1 year showed that in 10 (90.9%) cases, the strength of the hand grip was completely restored or there was a slight decrease in the main group. In one (9.1%) case, there was a moderate recovery of the volume of movement in the wrist and wrist joints. In case of impression comminuted fractures of the distal end of the forearm bones, the use of our tactics of surgical treatment using Ilizarov devices improves and stabilizes the reposition with a decreas.

Key words: fracture of the distal epimetaphysis of the forearm bones, distraction, Ilizarov apparatus.

The relevance of the work. Injuries of the distal end of the forearm bones (DCCP) occupy one of the leading places in the overall structure of diseases and injuries of the musculoskeletal system, which accounts for 8 - 36% of all skeletal bone fractures, 60 - 90% from fractures of the forearm bones and among them , the most severe intra - articular unstable fractures are 25,2-55% [1.3.5.7.9.11].

Literature data indicate that 43.8% of the victims are over 60 years old. The higher frequency and more complex nature of fractures in old age are certainly associated with age-related metabolic disorders in bone tissue and osteoporosis of various etiologies [10, 11].

Surgical treatment methods, including the technique of out-of-focus compression distraction osteosynthesis (VCDO) is a convenience in use, which is aimed at a closed reposition with stable fixation for a weight consolidation period of about 6-7 weeks. This method is universal and convenient for open fractures of the distal metaepiphysis of the forearm bones, as well as for severe fractures of type B and C according to the AO classification, which is explained by the traction technique of reposition (ligamentotaxis) of small fragments by preserving their connection with soft–tissue and ligament - bag devices [2.4.6.8.10.12].

The use of VCDO showed unsatisfactory results and complications associated with the technical aspects of carrying the spokes through the metacarpal bones of the hand and the stage of distraction to the fracture area, which was characterized by a violation of the biomechanics of traction with the absence of a full-fledged reposition and the leaving of residual mixing of fragments.

To develop or improve the technique of EKDO is an urgent task of modern traumatology with the position of the technique of bloodless reposition of bone fragments and carrying spokes through the metacarpal bones of the hand, especially in elderly patients with severe osteoporosis.

The purpose of the study: to improve the method of transosseous distraction osteosynthesis in fractures of the distal end of the forearm bones.

Materials and methods of research. The analysis was carried out based on the results of treatment of 21 patients aged 45 to 65 years who were hospitalized in the department of emergency traumatology of the Bukhara branch of the Republican Scientific Center for Emergency Medical Care (RNCEMP) in the period from 2019 to 2021. Among the observed patients with fractures of the distal end of the forearm bones (DCCP), the majority were men in 13 (83%) and women in 8 (17%) cases over the age of 45 years (there is a history of postmenopausal osteoporosis). DCCP fractures in 43.5% of cases ($p < 0.05$) occurred in the older age group – from 45 to 74 years, which indirectly reflected the relationship of the problem with age-related involutive osteoporosis. by the nature of the injury: as a result of falling from a height of his own height with an emphasis on the hand (hypoergic injury) in 16 (76.2%) cases, as a result of an accident in 3 (14.3%) and falling from a height of more than 1.5 m in 2 (9.5%) cases. The injury period before surgery ranged from three hours to 18 days, with an average of 8.4 ± 3.2 knocks at $p < 0.02$.

All patients underwent standard clinical and radiological (radiography in 2 projections and MSCT) methods of investigation.

The patients were divided into two main and control groups depending on the technique of the performed method of distraction osteosynthesis. The main group consisted of 11 (52.4%) victims who underwent distraction osteosynthesis according to our developed methodology. The control group included 10 (47.6%) patients operated using the traditional technique of distraction osteosynthesis [15.17.19.21.23.25.27.29.31].

Characteristics of the knitting technique. The goal of our development was based on holding the spokes somewhat diagonally closer from the base of the II metacarpal bone and closer to the head of the V metacarpal bone, which allows to give ulnar deviation to the cyst and easily restore the angle of radial inclination of the distal meta-epiphysis of the forearm bones. The distraction between the supports helps to ensure adequate reposition of fragments under the influence of the ligamentotaxis mechanism.

Indications for the operation were:

significant shortening of the radius length of more than 5 mm;

- displacement of fragments forming the articular surface of the radius of more than 2 mm;
- displacement of the inclination of the articular surface of the radius to the back side of more than 20 degrees;
- difficult-to-repair and poorly held near- and intra-articular fractures (C1 and C3, according to the AO classification), unstable intra-articular compression fractures with the presence of discongruence in the wrist joint;

Osteosynthesis was performed on an average of 3.9±1.8 days ($p > 0.05$). In both groups, external fixation devices (AVF) were used for osteosynthesis. In the control group (n=10), the classical principles of surgical treatment of intra-articular fractures of the DCCP were adhered to. In the main group (n=11), an improved technique was applied in the BDO using the Ilizarov apparatus, complete with 2 half-rings in 3 bearing supports.

Patients of the main group used a "Device for repositioning fractures of the bones of the hand."

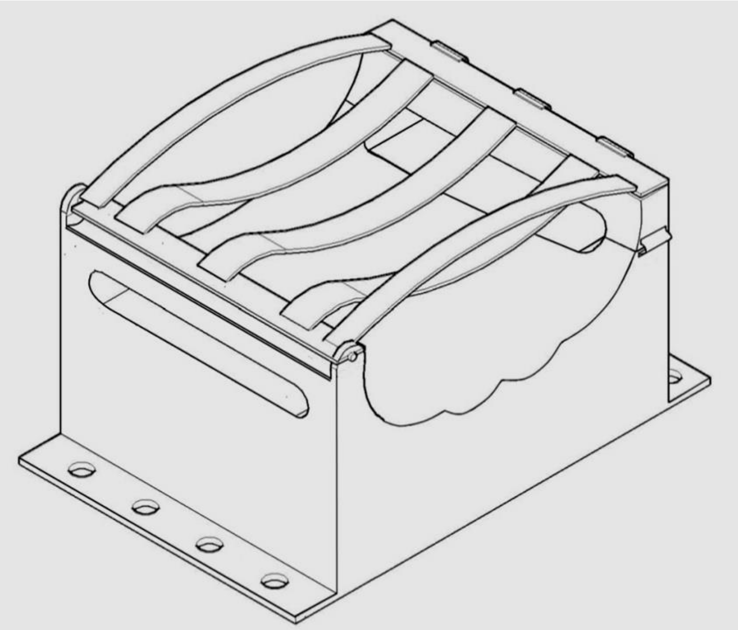


Figure 1, a device for repositioning fractures of the hand bones, a. closed position and b. open position of the device.

The developed device is patented by the Intellectual Property Agency of the Republic of Uzbekistan FAP No. 00216, (22.04.2004).

The technique of using the proposed device will be considered in one clinical example.

A device for repositioning fractures of the forearm and hand bones is used as follows.

A device for repositioning fractures of the forearm bones is pre-installed (Fig.1) and brushes on a special retractable stand of the operating table, fix it with fastening elements in the form of a set of hooks in the holes on the protruding elements in the form of plates at the base of the support of the brush holder. Under general anesthesia, the patient is treated with antiseptic solutions in a supine position, the upper limb is treated with antiseptic solutions. The operated upper limb is placed in a recess in the form of a half-cylinder with the palm surface of the hand, while the II-V fingers of the hand are placed in the recesses for the fingers of the hand on one side of the support of the brush holder (Fig.3), and the I finger is left outside the device. The brush is pressed with a clamp installed through the holes on the lugs of the side of the brush holder support by means of protruding elements in the form of rods at the ends of a straight rigid bar, made in the form of a lattice consisting of three parallel flexible in the center and two convex rigid laths on the sides, connected on both sides by casting perpendicular to straight rigid bars. Three staples are fixed on a straight rigid bar of the lattice clamp, and the bracket is in the hole at the side top of the support. At the same time, parallel three flexible clamp straps hold the II-V metacarpal bones of the hand at the level of one line. Through the hole on the side of the brush holder support, through the II-V metacarpal bones of the hand, a

Kirschner spoke is drilled in the direction of the hole on the opposite side. (Fig.3) The clamp and the side, made with the possibility of lifting by means of a hinge loop at its base, are released from fixing from four brackets and holes at the side top of the support, raised. The brush with the needle installed in it is removed from the device. The ends of the spokes are mounted on the clips of the half-rings of the Ilizarov apparatus. After passing another spoke through the middle third part of the forearm bone, a second half-ring of the Ilizarov apparatus is installed on it. The half-rings of the Ilizarov apparatus installed in parallel on the back surface of the forearm and hand are connected by three complete threaded rods and nuts, creating distraction and compression in the damaged limb. Antiseptic balls are applied to the knitting needles. Ilizarov's device is placed under outpatient control for an average of 70 days [12.14.16.18.20.22.24.26.28.30.32.34].

A clinical example. Patient F.J., born in 1999, medical history No. 138781-483, was admitted urgently to the department on 20.06.2019 with the diagnosis: "Closed fracture of the distal epimetaphysis of the right radius" Figure 2-A, B.



A. B.

Figure 2, a, b, radiographs of a patient with a fracture of the distal end of the right radius with displacement of bone fragments.

The patient was operated on on 22.06.2019. Under general anesthesia, the right upper limb was treated with antiseptic solutions in a supine position. The device for repositioning fractures of the hand bones is installed on a special sliding stand of the operating table and fixed. The operated right upper limb is placed in a recess in the form of a half-cylinder by the palm surface of the hand, while the II-V fingers of the hand are located in the recesses for the fingers of the hand on one side of the support of the brush holder, and the I finger is left outside the device. The brush is fixed with three brackets on the straight rigid bars of the lattice clamp, and with a bracket in the hole at the side top of the support. At the same time, parallel three flexible clamp bars held the II-V metacarpal

bones of the hand at the level of one line. Through the hole on the side of the support of the brush holder, through the II-V metacarpal bones of the hand, a Kirschner spoke was drilled in the direction of the hole on the opposite side Figure 3.

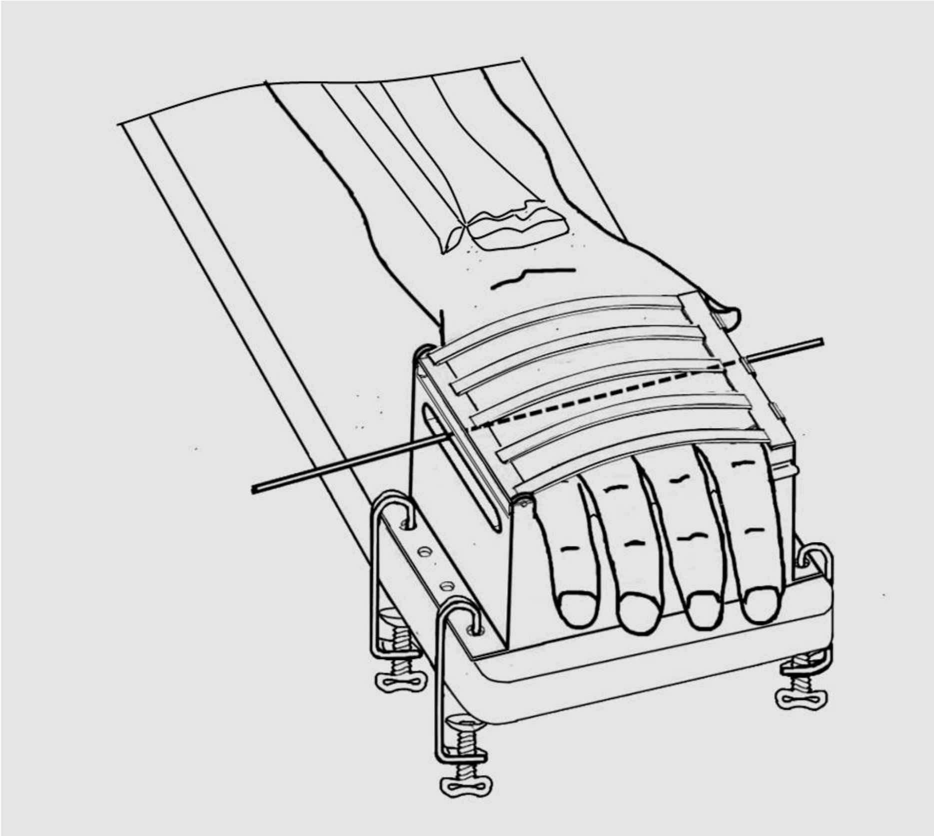
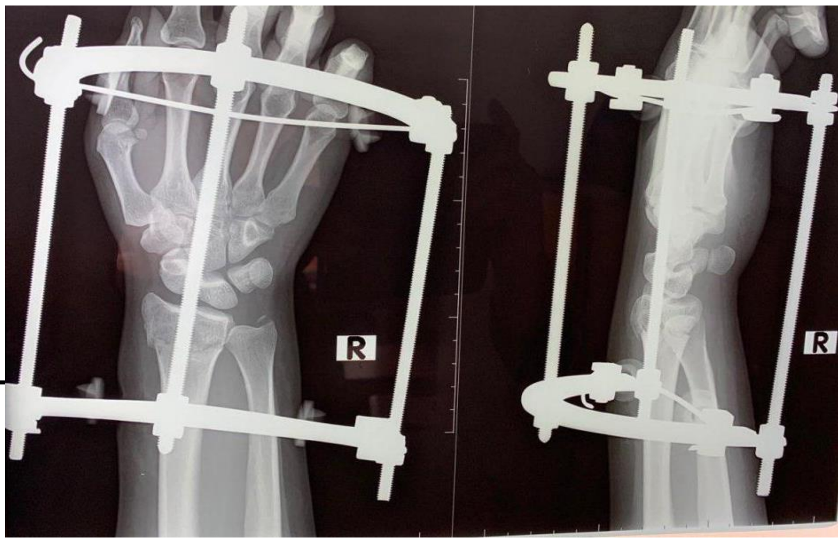


Figure 3. Application of the device for holding the spokes.

The brush with the needle installed in it has been removed from the device. The ends of the spokes are mounted on the clips of the half-rings of the Ilizarov apparatus. Another spoke was passed through the middle third of the forearm bone and the second half-ring of the Ilizarov apparatus was installed on it. The semi-rings of the Ilizarov apparatus installed in parallel on the back surface of the forearm and hand are connected by three complete threaded rods and nuts. Distraction and compression have been created in the injured limb. Aseptic balls are applied to the knitting needles. Ilizarov's device is installed under outpatient control for 75 days. The patient was discharged on 27.06.2019 in a satisfactory condition Figure 4- A, B.



A. B.

Figure 4, a, b, radiographs of the patient after installing the Ilizarov apparatus with a good result.



Restoration of the amplitude of movements in the wrist joint 6 months after surgery: a complete restoration of flexion and extension in the wrist joint is determined (Figure 5, a, b, c, d).

The removal of the Ilizarov apparatus was carried out on average for 59.5 ± 4.6 days with a span of 7 to 10 days after the control radiography.

In almost all (91%) cases, the first group managed to eliminate all types of displacement and maintain the achieved reposition throughout the entire observation period. The results of surgical treatment were evaluated 6-12 months after the surgical intervention.

The results were evaluated according to the following criteria:

- restoration of the anatomy of the articular surface of the radius according to radiography;
- restoration of the amplitude of movements in the wrist joint;

- evaluation of clinical and functional indicators on the scale of the DASH questionnaire, developed at the University of Michigan (USA) "DASH" (1996);- DASH scale = £ (n-1)x25/ N, where N is the number of completed answers, n is the scores.

The radiological criteria for assessing the anatomical restoration of the radius were: the absence of displacement of fragments forming the articular surface of the radius; restoration of the length of the radius relative to the ulna, restoration of the angle of inclination of the articular surface of the radius relative to its axis and radioulnar angle. Radiometric indicators are shown in Table 1.

Table 1

Average radiometric indicators before and after treatment

Indicator	**Survey period**	**Groups (n=21)**			
		Main (n=11) Counter (n=10)		Main (n=11) Counter (n=10)	
		Абс.	**%**	**Абс.**	**%**
Displacement of bone fragments forming the articular surface of the radius with a step of more than 2 mm	before treatment	11	100%	10	100%
	Recovery 12 months after surgery	11	100%	5	50%
The relative shortening of the radius is more than 5 mm	before treatment	11	100%	10	100%
	Recovery 12 months after surgery	11	100%	6	60%
Violation of the angle of inclination of the articular surface of the radius of more than 10 °	before treatment	11	100%	10	100%
	Recovery 12 months after surgery	10	90,9%	6	60%
Violation of the radioulnar angle of more than 10°	before treatment	11	100%	10	100%
	Recovery 12 months after surgery	9	81,8%	5	50%

According to Table 1, it can be seen that, when analyzing radiometric data in patients of the main group according to the values of "displacement of fragments more than 2 mm" and "relative shortening of the articular surface of the radius more than 5 mm" in the postoperative period, there was a noticeable improvement in the indicators in patients of the main group according to 100% results against 50% and 60% of the control group, respectively.

According to the data of "violations of the angle of inclination of the articular surface of the radius of more than 10°" and "violations of the radioulnar angle of more than 10°", the results were also better in patients of the main group in 90.9% and 81.8% of cases against 60% and 50% of cases of the control group ($P<0.001$).

To study the amplitude of movement in the wrist joint we used a standard goniometer and carried out a comparative analysis of the obtained values as a percentage in relation to the volume of movements of the intact wrist joint on a five-point evaluation scale.

For functional analysis, the DASH - (Disability of the Arm, Shoulder and Hand Outcome Measure (1996) scale was used with the allocation of 6 main points; the main test consists of 30 questions characterizing the movements of the hand that the patient performs in everyday life [33.35.37.39.40.41.42].

It was revealed that 6 months after the operation in 8 (72.7%) patients of the main group, the amplitude of movements was completely restored and in 3 (27.3%) – there was a slight (within 20°) restriction of movements in the wrist joint. After 12 months from the moment of surgery, an improvement was observed – a complete restoration of the amplitude of movements in 2 out of three patients, who had a slight restoration of movement in the wrist joint in the early period of rehabilitation. Only one patient has incomplete recovery of movements due to the lack of compliance with precautions during rehabilitation. At the same time, a complete fusion was obtained at the fracture level with the formation of a full-fledged bone callus according to radiography.

In the second group (10 cases), 10 patients were examined for whom osteosynthesis was performed according to the traditional method. The duration of fixation of fractures on the external fixation device was 7-10 weeks after surgery. In one victim with an extra—articular fracture, the device was dismantled at an earlier date - 29 days after surgery due to the developed inflammation of soft tissues in the area of the spokes. Two of them had incomplete comparison of bone fragments due to insufficient distraction on the external fixation device.

A study in the long term from 6 months to 1 year showed that in 10 (90.9%) cases, the strength of the hand grip was completely restored or there was a slight decrease in the main group. In one (9.1%) case, there was a moderate recovery of the volume of movement in the wrist and wrist joints. In case of impression comminuted fractures of the distal end of the forearm bones, the use of our tactics of surgical treatment using Ilizarov devices improves and stabilizes the reposition with a decrease in postoperative complications, such as shortening of the limb and improper fusion (Diagram 1).

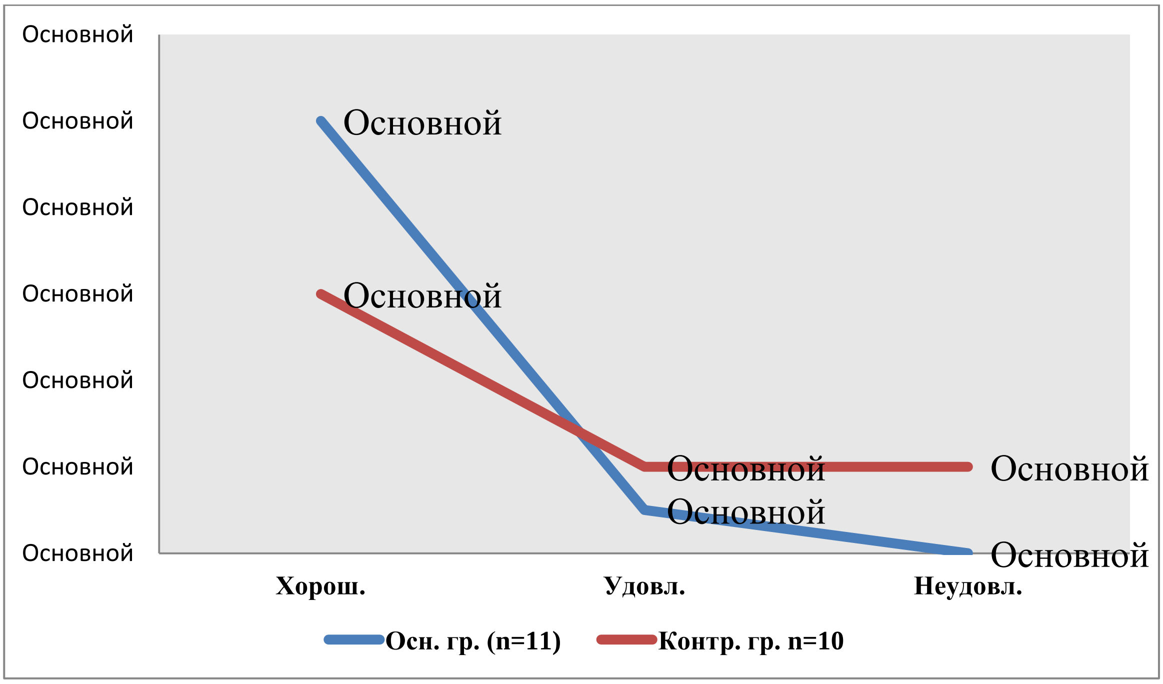


Diagram 1. Long-term results of treatment of patients with DMPC fractures.

Comparable outcomes according to Figure 1 of the DASH questionnaire: in 6 (60%) patients of the control group, the results were assessed as good against 10 (90.9%) cases of the main group. Satisfactory results were evaluated in 2 (20%) cases in patients of the control group versus 1 (10%) case of the main group. Unsatisfactory results were noted in patients of the control group in 2 (20%) cases in the absence of such results in patients of the main group (P<0.001) [34.36.38.40].

Discussion: This clinical study made it possible to analyze the method of surgical treatment of CDO used in modern traumatology practice for the treatment of patients with fractures of DMECP. For the analysis, we used data obtained as a result of both objective (radiography, radiometry, dynamometry) and subjective (DASH questionnaire) examination methods.

Primary restoration and preservation of the anatomy of DMECP, especially in the case of intra-articular fractures, directly of the articular surface of the radius, was of paramount importance for the prediction and further analysis of the final result of surgical treatment [9]. These studies have shown that the use of a distraction device allows in 90.9% of patients to restore the anatomy of the articular surface of the distal end of the forearm bones. While in the treatment with the use of an external fixation device, in one case with intra-articular fractures, it was not possible to preserve anatomical relationships in the long-term period. The worst functional result in the patient is associated with a long period of overload of the ligamentous apparatus of the wrist joint as a result of distraction efforts of the external fixation apparatus and, as a consequence, the formation of a complex regional pain syndrome with persistent post-immobilization contracture.

Conclusions.

1. Evaluation of the effectiveness of the distraction method of treatment of patients with DMPC fractures made it possible to develop indications for the choice of surgical treatment depending on the type (type) of fracture.

2. The results of the patients of the main group showed that diagonal knitting needles to the metacarpal bones allows for ulnar deviation of the cyst, which is important for adequate restoration of the angle of radial inclination of the distal meta-epiphysis of the forearm bones.

3. The use of the developed brush holder device keeps the II-V metacarpal bones of the hand in one line, which creates the condition for non-traumatic carrying of the spokes through the metacarpal bones.

3. Intra-articular comminuted fractures (type C) require precise reposition of fragments with restoration of the integrity of the articular facet, stable fixation for the entire period of formation of the callus and early development of movements in the joint.

References:

1. В.Р. Акрамов, Ш.Ш. Ахмедов, Б.У. Хамраев, А.А. Тешаев Э.М. Хаятов, У.У. Раджабов., Эндопротезирование тазобедренного сустава при переломах шейки бедренной кости //. Проблемы биологии и медицины.- Самарканд №3 (96) 2017. стр- 23-26.
2. Акрамов В.Р. Особенности эндопротезирования тазобедренного сустава при анатомических нарушениях вертлужной впадины. “БЮЛЛЕТЕНЬ АССОЦИАЦИИ ВРАЧЕЙ УЗБЕКИСТАНА” Узбекистан г.Ташкент № 3 – 2011 , Стр.94-97
3. Акрамов В.Р. Некоторые проблемы эндопротезирования ранее оперированного тазобедренного сустава. “БЮЛЛЕТЕНЬ АССОЦИАЦИИ ВРАЧЕЙ УЗБЕКИСТАНА” Узбекистан Ташкент № 2 – 2011 , Стр.110-113.
4. Акрамов В.Р.,Ахмедов Ш.Ш., Хамраев Б.У- (Эндопротезирование тазобедренного сустава при переломах шейки бедренной кости) “ПРОБЛЕМЫ БИОЛОГИИ И МЕДИЦИНЫ ” Узбекистан г. Самарканд № 3 – 2017 (96), Стр.23-26
5. Акрамов В.Р.,Ш.Ш.,Хамраев А.Ш,Хамраев Б.У – (Тотальное эндопротезирование тазобедренного сустава и профилактика возможных осложнений) “НОВЫЙ ДЕНЬ В МЕДИЦИНЕ” Узбекистан. г. Ташкент, №4 (20) 2017, Стр.56-58
6. Акрамов В.Р., Ахмедов Ш.Ш., Хамраев А.Ш., Хамраев Б.У- (Эндопротезирование тазобедренного сустава при дегенеративно-дистрофических заболеваниях у взрослых) “БЮЛЛЕТЕНЬ АССОЦИАЦИИ ВРАЧЕЙ УЗБЕКИСТАНА” Узбекистан г.Ташкент № 2 – 2018, Стр.42-44.
7. V.R.Akramov,B. A.SH.Khamraev, SH.SH.Akhmedov, B.U.Khamraev,(The Arthroplasty Of The Hip At Fracture Of A Neck Of A Femur) European Journal of Business & Social Sciences., ISSN: 2235-767X.,Volume 07 Issue 05.,May 2019.
8. V.R.Akramov,B. A.SH.Khamraev, SH.SH.Akhmedov, B.U.Khamraev,(Prevention Of Possible Complications Before And After Total Endoprotesization Of The Combin) European Journal of Business & Social Sciences., ISSN: 2235-767X.,Volume 07 Issue 05.,May 2019.
9. Асилова Саодат Убайевна., Акрамов Вохид Рустамович., Ахмедов Шамшод Шавкатович., Мирзамуродов Хабибжон Халимович (Ташкент, Узбекистан).//ОЦЕНКА РЕЗУЛЬТАТОВ ЛЕЧЕНИЯ ПРИМЕНЕНИЯ ОБОГАЩЕННОЙ ТРОМБОЦИТАМИ ПЛАЗМЫ ПРИ АСЕПТИЧЕСКОМ НЕКРОЗЕ ГОЛОВКИ БЕДРЕННОЙ КОСТИ. POLISH SCIENCE JOURNALЮ., ISSUE 12(33) Part 2. WARSAW, POLAND Wydawnictwo Naukowe "iScience" 2020.

10. НА Корж, ВА Филиппенко, ВА Танькут, ВР Акрамов, АВ Танькут. ПЕРВИЧНОЕ ЭНДОПРОТЕЗИРОВАНИЕ НА РАНЕЕ ОПЕРИРОВАННОМ ТАЗОБЕДРЕННОМ СУСТАВЕ.// Вісник морської медицини. Украина. № 2 2011,Стр.196-197.
11. Асилова Саодат, Акрамов Вохид, Назаров Равшан, Ахмедов Шамшод. МРТ-исследование у пациентов с идиопатическим кокаартрозом тазобедренного сустава.// Международный журнал психосоциальной реабилитации. № 2 Том 24 2020, Стр.410-415.
12. Ахмедов Ш. Ш. и др. ЭНДОПРОТЕЗИРОВАНИЕ ТАЗОБЕДРЕННОГО СУСТАВА ПРИ ДЕГЕНЕРАТИВНО-ДИСТРОФИЧЕСКИХ ЗАБОЛЕВАНИЯХ У ВЗРОСЛЫХ //КОЛОНКА РЕДАКТОРА. – 2008.
13. Ахмедов Ш. Ш. и др. The peculiarities of prophylaxis of pulmonary thromboembolism after total hip endoprosthesis in dysplastic coxarthrosis //Новый день в медицине. – 2020. – №. 2. – С. 53-55.
14. Akhmedov S. The arthroplasty of the hip at fracture of a neck of a femur //European Journal of Business and Social Sciences. – 2019. – Т. 7. – №. 5. – С. 1423-1428.
15. Тешаев А., Асилова С., Ахмед С. Аппаратно-хирургическое лечение переломов дистального конца костей предплечья // Европейский журнал молекулярной и клинической медицины. - 2020. - Т. 7. - №. 3. - С. 3906-3919.
16. Ахмедов Ш. Ш. и др. Особенности профилактики ТЭЛА после тотального эндопротезирования при диспластических коксартрозах. – 2020.
17. Shavkatovich A. S., Shahobovich K. A., Esonboevich T. B. METOD FOR OPTIMIZATION OF PIPE JOINT ENDOPROSHETICS IN DYSPLASTIC COXAARTHROSIS //Euro-Asia Conferences. – 2021. – Т. 3. – №. 1. – С. 204-205.
18. Shavkatovich A. S., Shahobovich K. A., Esonboevich T. B. METHOD OF EARLY REHABILITATION AFTER TOTAL HIP ENDOPROSHETICS IN DYSPLASTIC COXARTHROSIS //E-Conference Globe. – 2021. – С. 184-185.
19. Хамраев А. Ш., Тугузов Б. Э., Ахмедов Ш. Ш. Оптимизация тотального эндопротезирования тазобедренного сустава при диспластическом коксартрозе //Врач скорой помощи. – 2020. – №. 8. – С. 60-71.
20. Shavkatovich A. S. Prevention of possible complications before and after total end protestation of the combine //European Journal of Business and Social Sciences. – 2019. – Т. 7. – №. 5. – С. 1413-1422.
21. Mirzamurodov Habibjon Halimovich, Nurulloev Sukhrob Ozodovich. IMPROVEMENT OF SURGICAL TREATMENT OF PATIENTS WITH COMBINED DEGENERATIVE-DYSTROPHIC PATHOLOGY OF THE HIP JOINT AND SPINE WITH PREVALENCE OF MANIFESTATIONS OF COXARTHROSIS// British Medical JournalVolume-1, No 2., 2021. P.180-187.
22. Mirzamurodov, Habibjon H. (2021) "FEATURES OF SURGICAL TACTICS OF TREATMENT OF PATIENTS WITH COXOVERTEBRAL SYNDROME," Central Asian Journal of Medicine: Vol. 2021 : Iss. 2 , Article 7.
23. Mirzamurodov H. H. New approaches to treatment of patients with coxovertebral syndrome //Asian journal of Pharmaceutical and biological research. – 2021. – Т. 10. – №. 2. – С. 9-19.

24. Ходжанов И.Ю., Мирзамуродов Х.Х. «Тазово-вертебральный синдром, диагностика и лечение». *научно-практический журнал «Травматология, ортопедия и реабилитация»* 1 (2021): 70-76.
25. Kh, Mirzamurodov H., I. Yu Khodzhanov, and S. O. Nurulloev. "Complex conservative therapy for hip-spine syndrome." *International Scientific and Educational electronic journal" Education and science in the xxi century* (2021): 1438-1439.
26. Kh, Mirzamurodov Kh, et al. "Optimization of total hip arthroplasty in dysplastic coxarthrosis." *New day in medicine* 4 (2020): 32.
27. Nurulloyev S. O., Mirzamuradov H. H. Morphological Changes In Bone Tissue In Chronic Osteomyelitis On The Background Of Application Of Plate Concentrate //The American Journal of Medical Sciences and Pharmaceutical Research. – 2021. – Т. 3. – №. 04. – С. 160-164.
28. Nurullaev S. O. et al. Our experience in the treatment of grade I-II gonarthroa with hyaluronic acid preparations //ACADEMICIA: AN INTERNATIONAL MULTIDISCIPLINARY RESEARCH JOURNAL. – 2020. – Т. 10. – №. 12. – С. 1767-1771.
29. Nurulloev S. O., Kh M. K. Our experience in the treatment of degree i-ii gonarthrosis with drugs hyalouranic acid //Innovation in the modern education system. – 2021. – №. 1 Part 5. – С. 546-548.
30. НуруллоевС., & Бахранов, Б. (2021). Анализ Частоты Встречаемости Ацептического Некроза Головки Бедренной Кости После Covid-19. *CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES*, 284-287.
31. Nurulloev, Sukhrob O. (2021) "FEATURES OF MORPHOLOGICAL CHANGES IN THE BONES AND SURROUNDING TISSUES IN CHRONIC OSTEOMYELITIS AND TREATMENT WITH LASER OSTEOPERFORATION," *Central Asian Journal of Medicine*: Vol. 2021 : Iss. 2 , Article 8.
32. Nurulloyev Sukhrob Ozodovich. Analysis of morphological changes in the bones after osteomyelitis and features of treatment methods // Asian journal of Pharmaceutical and biological research. Volume 10 Issue 2 MAY-AUG 2021
33. Хамраев Б. У., Акрамов В. Р. Программа для выражения способа лечения методом блокирующего интрамедуллярного остеосинтеза при переломе бедренной кости //Свидетельство об официальной регистрации программы для ЭВМ. Агентство по интеллектуальной собственности Республики Узбекистан. – 2019.
34. Khamraev B.U., Akhmedov Sh.Sh. TWO-STAGE REVISION HIP REPLACEMENT PATIENS WITH SEVERE ACETABULUM DEFECT (CASE REPORT) // Asian journal of Pharmaceutical and biological research. Volume 10 Issue 2 MAY-AUG 2021.
35. Khamraev B.U., Akhmedov Sh.Sh. OUR EXPERIENCE OF TREATMENT OF FEMOR FRACTURES BY THE METHOD OF INTRAMEDULAR LOCKING OSTEOSYNTHESIS. // Asian journal of Pharmaceutical and biological research. Volume 10 Issue 2 MAY-AUG 2021.
36. Uktamovich H. B., Shavkatovich A. S. OPTIMIZATION OF BLOCKING INTRAMEDULLARY OSTEOSYNTHESIS METHODS FOR FEMORAL FRACTURES //Asian journal of pharmaceutical and biological research. – 2021. – Т. 10. – №. 3.

37. Uktamovich H. B., Shavkatovich A. S. BLOCKING INTRAMEDULLARY OSTEOSYNTHESIS-AS EFFECTIVE METHOD FOR FEMORAL FRACTURES //Asian journal of pharmaceutical and biological research. – 2021. – T. 10. – №. 3.
38. Khamraev B. U., Akramov B. P. Program for expressing the method of treatment by the method of blocking intramedullary osteosynthesis for a fracture of the femur //Certificate of official registration of a computer program. Agency for Intellectual Property of the Republic of Uzbekistan. – 2019.
39. Amrilloevich N. D. Features of the application of external osteosynthesis in gonarthrosis //Asian journal of Pharmaceutical and biological research. – 2021. – T. 10. – №. 2.
40. Uli Z. A. K., Amrilloevich N. D. MORPHOLOGICAL CHANGES IN THE HYALINE CARTILAGE OF THE KNEE JOINT AGAINST THE BACKGROUND OF INTRA-ARTICULAR ADMINISTRATION OF THE PREPARATION OF HYALURONIC ACID IN RATS WITH EXPERIMENTAL OSTEOARTHRITIS //Asian journal of pharmaceutical and biological research. – 2021. – T. 10. – №. 3.
41. Uli Z. A. K., Amrilloevich N. D. MORPHOGENESIS OF HYALINE CARTILAGE OF THE KNEE JOINT AGAINST THE BACKGROUND OF INTRA-ARTICULAR INJECTION OF PLATELET-RICH AUTOLOGOUS PLASMA //Asian journal of pharmaceutical and biological research. – 2021. – T. 10. – №. 3.
42. Ziyadullaev Abdusalom Khabibulla oglu. EVALUATION OF THE FUTURE RESULTS OF APPLICATION OF ARTHRO-MEDULLARY BYPASSING IN GONARTHROSIS. // Asian journal of Pharmaceutical and biological research. Volume 10 Issue 2 MAY-AUG 2021